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(75) Inventors/Applicants (for US only): **DALL'OCCHO, Tiziano** [IT/IT]; Via E. Farolfi, 3, I-44100 Ferrara (IT). **FUSCO, Ofelia** [IT/IT]; Via Mulinetto, 63, I-44100 Ferrara (IT). **NIFANT'EV, Ilya E.** [RU/RU]; Bakinskikh Komissarov, Str. 12/3, appt. 60, Moscow, 119899 (RU). **LAISHEVTSEV, Ilya P.** [RU/RU]; appt. V-1255 Main Building, Moscow State University, Lenin's Hill, Moscow, 117234 (RU).

(74) Agents: **COLUCCI, Giuseppe**; Basell Poliolefine Italia S.p.A., Intellectual Property, P.le G. Donegani, 12, I-44100 Ferrara et al. (IT).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

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(54) Title: PROCESS FOR THE PREPARATION OF ETHYLENE POLYMERS

(57) Abstract: Ethylene based polymers having high molecular weights can be obtained in high yields at temperatures of industrial interest, by carrying out the polymerization reaction in the presence of catalysts comprising single carbon bridged metallocenes, which has a particular ligand system containing a heteroatom.

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## INTERNATIONAL SEARCH REPORT

International Application No

PC., EP 00/13192

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C08F10/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C08F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 98 22486 A (JONES ROBERT L JR ;DUBITSKY YURI A (IT); ELDER MICHAEL J (IT); MON) 28 May 1998 (1998-05-28) cited in the application	1-15,25, 26
X	page 32-33; claim 9; examples 6-10	22
A	EWEN J A ET AL: "POLYMERIZATION CATALYSTS WITH CYCLOPENTADIENYL LIGANDS RING-FUSED TO PYRROLE AND THIOPHENE HETEROCYCLES" JOURNAL OF THE AMERICAN CHEMICAL SOCIETY,US,AMERICAN CHEMICAL SOCIETY, WASHINGTON, DC, vol. 120, 1998, pages 10786-10787, XP000907012 ISSN: 0002-7863 the whole document	1-15,22, 25,26

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

22 August 2001

Date of mailing of the international search report

29 October 2001 (29.10.01)

Name and mailing address of the ISA

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Authorized officer

Balmer, J-P

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/EP 00/13192

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

As a result of the prior review under R. 40.2(e) PCT,  
all additional fees are to be refunded.

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☒ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:  
1-15,22,25,26
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☒ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-15

Process for the preparation of polymers of ethylene with a metallocene catalyst

2. Claims: 16-17

Process for the preparation of a ligand

3. Claim : 18

Process for preparing a pre-ligand of formula (III)

4. Claim : 19

Process for the preparation of a pre-ligand of formula (III)

5. Claims: 20-21

Process for the preparation of a pre-ligand of formula (III)

6. Claim : 22

Process for the preparation of a metallocene compound of formula (I)

7. Claim : 23

Process for the preparation of a pre-ligand of formula (III)

8. Claim : 24

A pre-ligand of formula (III)

9. Claim : 25

A metallocene compound of formula (I)

10. Claim : 26

A ligand of formula (II)

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PC EP 00/13192

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
W0 9822486      A	28-05-1998	AU      733813 B	24-05-2001
		AU      5321698 A	10-06-1998
		BR      9715006 A	05-12-2000
		CN      1244201 A	09-02-2000
		EP      0938491 A	01-09-1999
		HU      9904527 A	28-05-2000
		JP 2001504824 T	10-04-2001
		NO      992352 A	08-07-1999
		PL      333462 A	20-12-1999
		TR      9901635 T	21-02-2000
		TW      394779 B	21-06-2000
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(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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